Brighton Division
Boston Municipal Court
Brighton, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

February 16, 2022

Tighe&Bond

100% Recyclable

Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the Brighton Municipal Courthouse on May 26th, 2021. While on site we inspected the air handling equipment located in the mechanical rooms and toured the facility to determine if the spaces generally matched usages noted on the architectural plans. Tighe and Bond was provided with mechanical design plans from 1994 and 2019. Our analysis is based on these drawings and our one day on site.

Site Visit Attendees:

- *Office of Court Management:*
  - Courthouse Facilities Staff
- *Tighe & Bond*
  - Ryan Ablondi, PE, Senior Mechanical Engineer
  - Matt Mancini, Staff Mechanical Engineer
  - Olivia Robillard, Staff Intern

1.1 Existing Ventilation System

The Brighton Municipal Courthouse was constructed in 1925 and is approximately 23,675 square feet in size. Two rooftop air handling units (RTUs) and three air handling units in the lower level provide ventilation air to the building. The two RTUs provide ventilation to the two main courtrooms on the main level and the three AHUs in the basement provide ventilation for the lower level and main level, outside of the courtrooms.

Each RTU contains a supply fan, refrigerant (DX) cooling coils, gas heat, and 2" MERV 13 filters. The supply fan is equipped with a variable speed drive but operates as a constant volume fan. The rooftop units were installed as part of the 2020 renovation and are in very good condition. The outside air and return air dampers and actuators are operational and in very good condition, and the heating and cooling coils are clean.

AHU-1 is a constant volume mixed air unit serving the core of the lower level including the courtroom on the lower level and the probation office area. AHU-1 contains mixed air dampers, 2" MERV-13 filters, a glycol hot water heating coil with 3-way control valve, a chilled water coil with 3-way control valve and a supply fan in a draw through configuration. Based on our physical inspection during the site walk through, the unit appears to be in fair working condition with all dampers, damper actuators and valve actuators appearing to be in good condition. This unit was installed in 1994 and is 27 years old.

AHU-2 is a 100% outside air, constant volume unit which provides outside air to fan coil unit (FCU) zones on the north side of the lower level and throughout the main level, outside of the courtrooms. This unit consists of an outside air damper, 2" MERV-13 filter, glycol hot water coil and supply fan in draw through configuration. This unit was installed in 1994 and is 27 years old.

AHU-3 is a 100% outside air, constant volume unit which serves the holding area on the south side of the lower level. This unit consists of an outside air damper, 2" MERV-13 filter, glycol hot water coil and supply fan in draw through configuration. This unit was installed in 1994 and is 27 years old.

The office areas outside of the courtroom on the main level and on the south side of the lower level are served by 2-pipe fan coil units. Outside air is provided to each FCU zone by AHU-2. Each FCU has a standard filter, supply fan and single water coil which is switched between heating and cooling seasonally. We believe all of these FCUs were installed in 1994 and are not aware of any that have been replaced more recently.

According to the drawings provided to Tighe & Bond, there are six exhaust fans serving the building. The fans were installed during the 2020 renovation project. Information regarding which space each exhaust fan serves is not show on the mechanical plans. All exhaust fans were running at the time of our site visit.

A boiler plant in the lower level mechanical room provides hot water to the lower level AHUs and FCUs throughout the building. The plant consists of four 300 MBH gas-fired modular boilers. Water is distributed to FCUs by two constant volume pumps. A separate HW loop with a single constant volume pump provides hot water to the AHUs in thew lower level.

A 50-ton, air cooled chiller located in the basement mechanical room provides chilled water to all air handlers and fan coil units. Based on the chiller serial number, it appears this chiller was manufactured in 1995. Heat rejection for the chiller is provided by a remote air-cooled condenser on the roof which was installed as part of the 2020 renovation.

Table 1 summarizes the air handling units' designed airflow rates, the MERV rating of the installed filters, and the condition of the units.

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Filters	Condition
AHU-1	3,255	1,120	2" MERV 13	Fair
AHU-2	2,600	2,600	2" MERV 13	Fair
AHU-3	1,255	1,255	2" MERV 13	Fair
RTU-1	4,000	1,200	2" MERV 13	Very Good
RTU-2	4,000	1,200	2" MERV 13	Very Good

Photo 1 – Representative Roof Top Unit (RTU)

Photo 2 – Representative Air Handling Unit (AHU)

1.2 Existing Control System

The HVAC equipment is controlled by an Automated Logic Building Management System (BMS). Air handlers, exhaust fans, boilers, chillers, fan coil units, etc. are all tied into the system. Based on the control screens on the BMS, there are no demand control ventilation (DCV) sequences for the ventilation equipment in the building. The two RTUs serving the courtrooms on the main floor have economizer sequences. It is unknown if AHU-1 has any economizer.

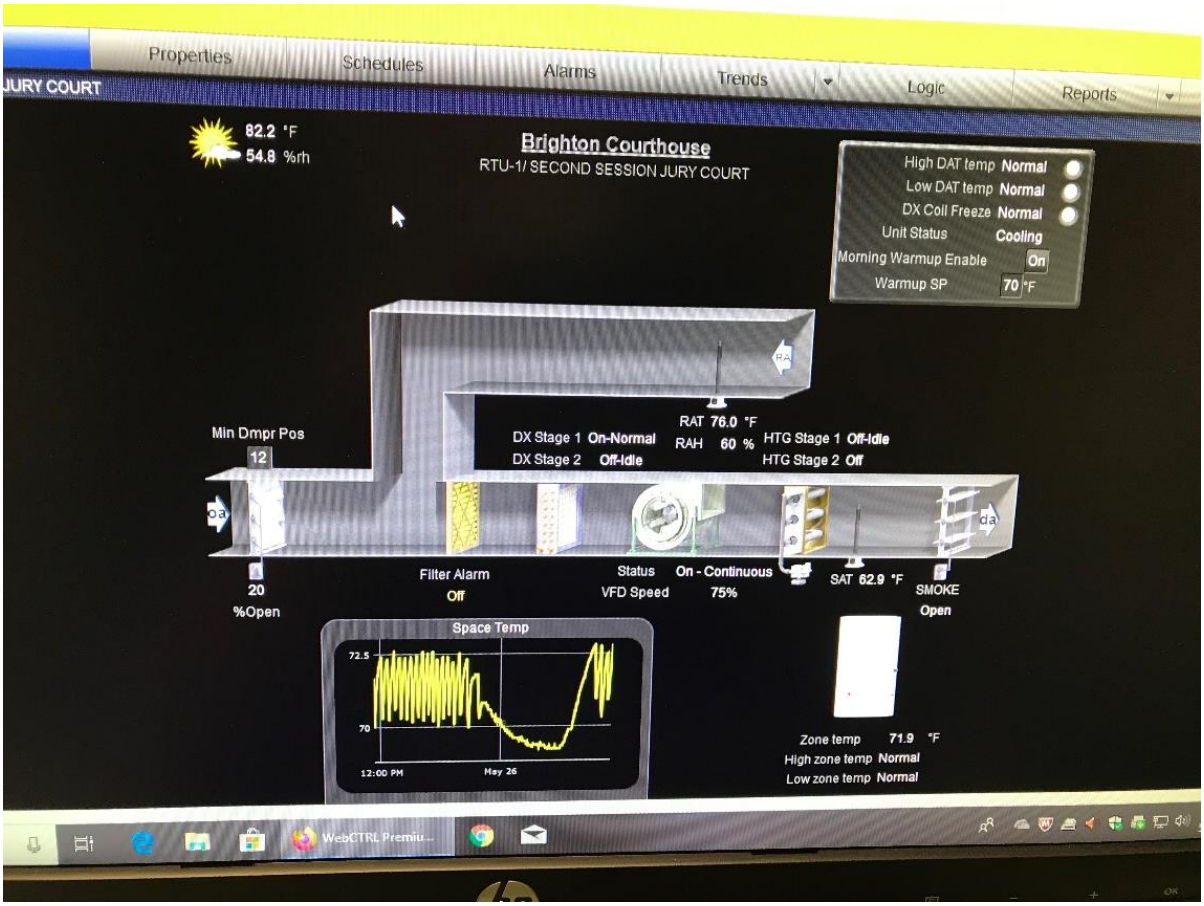


Photo 2 – BMS Screenshot

Section 2
Recommendations

Below is a list of recommendations for the Brighton Municipal Courthouse. Please refer to the "Overview of Recommendations" report for further explanation and requirements of the stated recommendations.

2.1 Filtration Efficiency Recommendations

The filters in the air handlers were already upgraded with 2" MERV 13 filters. The use of 2" MERV 13 meets the minimum ASHRAE recommendations for filtration during the pandemic. We recommend that a testing and balancing contractor test and document the airflow and static pressure profile of all air handlers, as outlined in recommendation RF-1 in the Overview of Recommendations document. This will help determine if the equipment can accommodate the increase in system static pressure associated with the addition of the MERV 13 filters.

We recommend the following measures be implemented for the existing air handling units:

RF-3: *Install a differential pressure sensor with a display across the filter bank.*

This recommendation pertains to AHU-1, 2 & 3 which do not have differential pressure sensors for filter alarming. RTU-1 & RTU-2 already have DPTs installed across the filter banks and connected to the BMS for alarming.

2.2 Testing & Balancing Recommendations

Air handling units, AHU-1, 2 & 3 are approximately 27 years old and it is unknown to Tighe & Bond when the last time the units were tested and balanced. Also, the code requirements to determine the outdoor air flow rates that were used to design the original system may be different than the 2015 International Mechanical Code (IMC) and current ASHRAE Standard 62.1 requirements.

The two rooftop units, RTU-1 & 2 were installed in 2020 and Tighe & Bond has reviewed a TAB report dated 11/05/2020 that shows that the units are operating as designed.

We recommend the following testing and balancing measures be implemented:

RTB-1: *Test and balance air handling unit supply air and minimum outdoor air flow rates.*

We recommend testing and balancing the outdoor air flow rates for air handling units AHU-1,2 & 3 to the recommended minimum O.A. rates listed in Table 2.

TABLE 2
Recommended Air Handler O.A. Flow Rates

Unit	Original Supply Airflow (CFM)	Original Design Min. O.A. (CFM)	Current Code Min. O.A. Requirements (CFM)	Recommended Minimum O.A. (CFM)
RTU-1	4,000	1,200	944	**1,200**
RTU-2	4,000	1,200	944	**1,200**
AHU-1	3,255	1,120	840	**1,120**
AHU-2	2,600	2,600	1,280	**2,600**
AHU-3	1,255	1,255	325	**1,255**

Note: Although the ASHRAE Position Document on Infectious Aerosols recommends using the latest published standards and codes as a baseline for minimum ventilation, the mechanical code in effect at the time the HVAC systems were designed and constructed is what governs the required outdoor air flowrate for the HVAC equipment, if there have been no additions, renovations, alterations or changes in occupancy to the building. The 2015 International Mechanical Code does not prevent the continued use of existing systems.

During the pandemic, we recommend maintaining the outdoor airflows at the original designed values where they exceed the code minimums calculated by Tighe & Bond. Supplying more outdoor than required by code will provide better indoor air quality.

The average airflow rate per person is shown below in Table 3. These values are based on the original full design supply airflow rate and the recommended outdoor airflow rates shown in Table 2. The airflow rate per person assumes a diversity factor of 70%, meaning the maximum number of occupants assumed to be in all zones at all times equates to 70% of the code required occupancy.

TABLE 3
Average Airflow Rate per Person

	All spaces	***Courtrooms***	***Non-Courtroom Spaces***
Total Occupancy (People)	285	209	76
Total Supply Air (CFM/Person)	53	38	94
Outdoor Air (CFM/Person)	26	11	65

The airflow rate per person for each Courtroom and the Jury Pool Room is shown below in Table 4. These values are based on full occupancy without taking diversity into account, the original full design supply airflow rate, and the recommended outdoor airflow rate. The airflow rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4
Airflow Rate per Person (Full Occupancy)

Courtroom	Total People	Total Air: Supply Airflow (CFM)	Total Air: Airflow Rate (CFM/Person)	Outdoor Air: Outdoor Airflow (CFM)	Outdoor Air: Airflow Rate (CFM/Person)
First Session Arrangement Courtroom	129	4,000	31	1,200	9
Second Session Jury Courtroom	129	4,000	31	1,200	9
Courtroom #3	32	420	13	145	5

Note: Courtroom occupant density is based on 70 people/1,000 square feet, per the 2015 International Mechanical Code

The airflow rate per person for each Courtroom and the Jury Pool Room, based on a reduced occupancy schedule determined by the Office of Court Management, is shown below in Table 4a. The airflow rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4a
Airflow Rate per Person (Reduced Occupancy)

Courtroom	Total People	Total Air: Supply Airflow (CFM)	Total Air: Airflow Rate (CFM/Person)	Outdoor Air: Outdoor Airflow (CFM)	Outdoor Air: Airflow Rate (CFM/Person)
First Session Arrangement Courtroom	23	4,000	174	1,200	52
Second Session Jury Courtroom	26	4,000	154	1,200	46
Courtroom #3	7	420	60	145	21

Note: If occupancy is further reduced, the airflow rate per person will increase, assuming full airflow is being delivered to the space.

RTB-3: *Increase outdoor air flow rate beyond minimum under non-peak conditions.*

Due to the age of the three AHUs in the lower level, the ability for the coils to maintain the supply air temperature is uncertain. For the two new RTUs, we recommend increasing the outdoor air flow rate by 10% to 30% beyond the recommend values in Table 2 during non-peak outdoor air conditions during the pandemic only. This may require additional controls to implement. We do not believe this would cause a threat of a potential coil to freeze given the amount of outdoor air as a percentage of total supply air, however cold spots on the coil may develop due to poor mixing. This may cause nuisance freeze stat trips via the existing freeze stat. If there is no existing freeze stat, we recommend installing one.

The return air to each air handler will also have to be adjusted to accommodate the additional outdoor air during the operation of this sequence.

RTB-6: *Test and balance all air handler chilled and hot water coils.*

Testing and balancing the air handler hot and chilled water coils will help ensure the coils are receiving the proper water flow rates. Due to the age of the coils, the coils

may not perform as required to properly temper the supply air. Coils become fouled over time, which degrades the performance.

2.3 Equipment Maintenance & Upgrades

We recommend the following equipment maintenance and upgrades for the three AHUs in the lower level, AHU-1, AHU-2 & AHU-3:

RE-1: *Test existing air handling system dampers and actuators for proper operation*.

Replace dampers and actuators that are not functioning properly.

RE-2: *Clean air handler coils and drain pans.*

RE-7: *Test the existing air handler control valves and actuators for proper operation.*

2.4 Control System Recommendations

We recommend the following for the control system:

RC-1: *Implement a pre and post-occupancy flush sequence.*

RC-2: *Install controls required to introduce outdoor air beyond the minimum requirements for RTU-1 & RTU-2.*

The existing BMS appears to be sophisticated enough to implement this type of sequence, however new control sequences must be defined.

RC-4: *Confirm the economizer control sequence is operational.*

RC-5: *Disable demand control ventilation sequences.*

We found no evidence on the EMS, drawings we received or during our walk-through of any demand control ventilation controls however, we recommend having the ATC service contractor verify this and disable any demand control ventilation sequences that may be in place.

2.5 Additional Filtration and Air Cleaning

We recommend the installation of the following air cleaning devices:

RFC-1: *Install portable HEPA filters.*

If the Courthouse is to operate at a high capacity (i.e. 50% occupancy or greater), we recommend installing portable HEPA filters in high traffic areas, such as entrance lobbies. They should also be considered for Courtrooms, depending on the occupancy of the room and how much noise is generated from the filters. The noise levels will vary depending on the manufacturer. Refer to the "Overview of Recommendations" document for further guidance on installing portable HEPA filters.

2.6 Humidity Control

Installing duct mounted or portable humidifiers can help maintain the relative humidity levels recommended by ASHRAE. The feasibility of adding active humidification is determined by the building envelope. Buildings that were not designed to operate with active humidification can potentially be damaged due to a lack of a vapor barrier, adequate insulation, and air tightness.

Duct mounted humidifiers must be engineered, integrated into the building control system, tested, and commissioned. They are available in many configurations but require substantial maintenance and additional controls. They also run the risk of adversely affecting IAQ from growing microorganisms, or leaking water through poorly sealed ductwork damaging insulation and ceilings. Portable humidifiers are easier to install and require less maintenance, but still have the potential to damage the building envelope.

While active humidification is not recommended as a whole building solution due to high installation costs, operational costs, potential to damage the building envelope and adversely affect poor IAQ, it may be warranted as a temporary solution in some areas.

2.7 Other Recommendations

2.7.1 Capital Planning for Replacement of Chiller

The existing chiller in the lower level mechanical room is approx. 27 years old and is likely approaching the end of its useful life. The chiller is currently in fair condition however ASHRAE data shows that the median life expectancy for chillers is 20-23 years. While immediate replacement is not necessary at this time, we would recommend developing a capital plan to replace this chiller in ~5 years.

2.7.2 Capital Planning for Replacement of Fan Coil Units

The existing FCUs serving the main and lower levels are approx. 27 years old and likely approaching the end of their useful life. As far as we know all of the FCUs are functional and in fair condition however, the average life expectancy for FCUs is 25-30 years. While immediate replacement is not necessary at this time, we would recommend developing a capital plan to replace these units in ~5 years.

Disclaimer

Tighe and Bond cannot in any way guarantee the effectiveness of the proposed recommendations to reduce the presence or transmission of viral infection. Our scope of work is intended to inform the Office of Court Management on recommendations for best practices based on the guidelines published by ASHRAE and the CDC. Please note that these recommendations are measures that may help reduce the risk of airborne exposure to COVID-19 but cannot eliminate the exposure or the threat of the virus. Implementing the proposed recommendations will not guarantee the safety of building occupants. Tighe & Bond will not be held responsible should building occupants contract the virus. The Office of Court Management should refer to other guidelines, published by the CDC and other governing entities, such as social distancing, wearing face masks, cleaning and disinfecting surfaces, etc. to help reduce the risk of exposure of COVID-19 to building occupants.

Section 3
Testing & Balancing Results

Milharmer Associates visited the Brighton Municipal Courthouse on October 15, 2021 to test the airflow rates of the air handling units. A summary of the tested airflow rates versus the design airflow rates from that visit are shown below in Table 5. Milharmer returned to the site on January 19, 2022 to test the exhaust fans and hot water coils. A summary of the design waterflow rates versus the actual waterflow rates is shown below in Table 6. A summary of the tested airflow rates versus the design airflow rates of the exhaust fans is shown below in Table 7. The full testing and balancing report is attached.

TABLE 5
Air Handler Airflow Testing & Balancing Results

	Design			Actual		
Unit	Total Supply Fan Airflow (CFM)	Recommended Outdoor Airflow (CFM)	Return Airflow (CFM)	Supply Fan Airflow (CFM)	Outdoor Airflow (CFM)	Return Airflow (CFM)
AHU-1	3,255	1,120	2,135	2,333	1,091	1,242
AHU-2	2,600	2,600	0	2,128	2,128	0
AHU-3	1,255	1,255	0	962	962	0
RTU-1	4,000	1,200	2,800	3,721	1,130	2,591
RTU-2	4,000	1,200	2,800	4,090	1,835	2,255

The typical balancing tolerance for air systems is ±10% of the design airflow.

TABLE 6
Air Handler Waterflow Testing & Balancing Results

	Design Hot Water Flow Rate (GPM)	Actual Hot Water Flow Rate (GPM)
AHU-1	5.8	6.2
AHU-2	14.2	15
AHU-3	7.5	8.5

TABLE 7
Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow (CFM)	Actual Return/Exhaust Airflow (CFM)
EF-1	Restrooms	820	704
EF-2	Restrooms	200	245
EF-3	Restrooms	300	336
EF-4	Restrooms	1,000	682
EF-5	Holding Cells	1,340	1,271
EF-6	Holding Cells	470	535

The typical balancing tolerance for air systems is ±10% of the design airflow.

In reviewing the airflow report data, the following should be noted:

1. AHU-1 is delivering a supply airflow rate that is not within the typical 10% tolerance of the design airflow rate. If each zone is not receiving its design supply airflow rate, then we cannot ensure that those zones are receiving their design outside airflow rates, even if the outside airflow to the unit is correct. We recommend rebalancing this unit to its design supply airflow rate. The balancing contractor noted that this unit will require a sheave change to increase the airflow to the design rate.
2. AHU-2 and AHU-3 are not within the typical 10% tolerance of our recommended airflow rates. Units that are not receiving the recommended outside airflow rates are not supplying each zone the code required outside airflow rates from our calculations. The external static pressures listed in the TAB report are high compared to the scheduled design total static pressures which may be causing the lower airflow. We recommend investigating possible causes for the higher static pressures and repairing and/or resheaving the units to get them back to design airflow.
3. RTU-2 is receiving an outside airflow rate that is above the typical 10% tolerance of our recommended airflow rate. This unit may be expending more energy than is necessary to heat/ cool the excess outside air. We recommend adjusting the outside air damper in order to rebalance the outside airflow rate to our recommendation.
4. Toilet exhaust fans EF-1, EF-2, EF-4, and EF-6 are not performing within acceptable range. We recommend rebalancing these exhaust fans to their design exhaust airflow rates. EF-4 may need to be replaced considering the large different in the actual flow rate vs. the design.
5. The hot water system is performing within an acceptable range of the design waterflow rates.
6. The chilled water system was not tested because the building was in heating mode at the time of the balancing contractors visit. We recommend the balancer return to test the chilled water system when the building is in cooling mode.

MILHARMER ASSOCIATES, INC.
534 New State Highway, Route 44, Suite 3
Raynham, MA 02767
Tel.: 508-823-8500; Facsimile: 508-823-8600

TEST AND BALANCE REPORT

Project: **Brighton Division, Boston Municipal Court PH 4**
Boston, MA

Project No.: **21-537** **Project Date:** **1/19/2022**

MECHANICAL CONTRACTOR
Tighe and Bond

3384

A N.E.B.B. Certified Company

Project:	Brighton Division, Boston Municipal Court PH 4		
Address:	Boston, MA		
Date:	1/19/2022	**Project No.**	21-537

CERTIFICATION

Submitted & Certified by:

Milharmer Associates, Inc.

Certification No.: ***3384*** Certification Expiration Date: **3-31-23**

The data presented in this Report is a record of system measurements and final adjustments that have been obtained in accordance with the current edition of the ***N.E.B.B. Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.*** Any variances from design quantities which exceed N.E.B.B. tolerances, are noted in the Test-Adjust-Balance Report Project Summary.

N.E.B.B. Qualified TAB Supervisor Name: **Scott F. Miller**

N.E.B.B. Qualified TAB Supervisor Signature:_____

Certification

SCOTT F. MILLER

HAS MET ALL REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN THE FOLLOWING DISCIPLINE

Testing, Adjusting and Balancing of Environmental Systems

This Certificate, as well as individual affiliation with a NEBB Certified Firm and associated NEBB Certification Stamp are REQUIRED to provide a NEBB Certified Report. Participation in the NEBB Quality Assurance Program requires the Certificant be affiliated with a NEBB Certified Firm

CP-23541

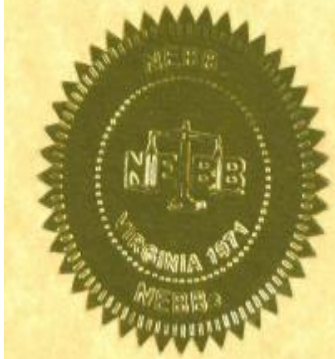
NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect



Firm Certification

MILHARMER ASSOCIATES, INC.

HAS MET ALL REQUIREMENTS FOR NEBB CERTIFIED STATUS IN THE FOLLOWING DISCIPLINE

Testing, Adjusting and Balancing of Environmental Systems

3384

NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

Project:	Brighton Division, Boston Municipal Court PH 4		
Address:	Boston, MA		
Date:	1/19/2022	**Project No.**	21-537

TABLE OF CONTENTS

SECTION 1 **TAB Qualifications**

A. N.E.B.B. Certification
B. N.E.B.B. Company Certificate
C. N.E.B.B. Supervisor Certificate
D. Instrument Sheet
E. Symbol Sheet

SECTION 2 **TAB Building Systems**

Project:	Brighton Division, Boston Municipal Court PH 4		
Address:	Boston, MA		
Date:	1/19/2022	**Project No.**	21-537

INSTRUMENT SHEET

The following is a list of Instruments owned and operated by Milharmer Associates, Inc. and used on this project.

Instrument ID Number	Instrument	Calibration Date	Calibration Due Date
1	ADM-870 Digital Multimeter	8-20-21	8-20-22
2	Shortridge Flow Hood	8-20-21	8-20-22
3	Ampmeter	8-20-21	8-20-22
4	Tachometer	8-20-21	8-20-22
5	Airflow Anemometer	8-20-21	8-20-22
6	Digital Thermometers	8-20-21	8-20-22
7	Shortridge Water Meter	8-20-21	8-20-22
8	Sound Meter	8-20-21	8-20-22
9	Vibration Meter	8-20-21	8-20-22

Please Note: Instruments are tested annually at the M.A.I. Lab. and sent back to the factory if deviation exceeds manufacturing tolerance.

Technician:

SYMBOL SHEET

AHU	Air Handling Unit	HEATER O.L.	Thermal Overload
AC or ACU	Air Conditioner Unit		Protection For Motors
ACCU	Air Cooled Condensing Unit		Located at Starter Motor
ADJ P.D.	Adjusted Pitch Diameter		
AMP	Amperage	HEPA	High Efficiency Particulate
AVG	Average		Arrestance
A.D.	Air Density	HOA	Hand/Off/Auto Switch
		H.P.	Horsepower
B.H.P.	Brake Horsepower	HPS	High Pressure Steam
		HRC	Heat (Recovery or Recliam) Coil
CFM	Cubic Feet Per Minute	HVAC	Heating, Ventilation and
CH	Chiller		Air Conditioning
CHWR	Chilled Water Return	HWR	Hot Water Return or
CHW or CHWS	Chilled Water Supply		Heating Water Return
CT	Cooling Tower	HWS	Hot Water Supply or
CWR	Condenser Water Return		Heating Water Supply
CW or CWS	Condenser Water Supply	HX	Heat Exchanger
DB	Dry Bulb	I.D.	Inside Diameter
D.D.	Direct Drive		
DIA	Diameter	LAT	Leaving Air Temperature
		L.D.	Linear Supply Diffuser
EAT	Entering Air Temperature	LPS	Low Pressure Steam
EDC	Electric Duct Coil	L.T.	Light Troffer
EDH	Electric Duct Heater	LWT	Leaving Water Temperature
EF	Exhaust Fan		
EMS	Energy Mgt System	MAU/MUA	Make Up Air Unit
EWT	Entering Water Temperature	MBH	1,000 BTU's per Hour
FCU	Fan Coil Unit	N.A.	Not Accessible
FH	Fume Hood	N/A	Not Applicable
F.L.A.	Full Load Amperage	N.I.	Not Installed
FPB	Fan Powered Box	N.L.	Not Listed
FPM	Feet Per Minute		
FT. HD.	Feet of Head		
GPM	Gallons Per Minute		

SYMBOL SHEET CONTINUED

O.D.	Outside Diameter	TAB	Testing, Adjusting, and Balancing
OA Min	Outside Air Minimum	TSP	Total Static Pressure
OAT	Outside Air Total	TP	Thermally Protected
PF	Power Factor	UH	Unit Heater
PHC	Preheat Coil		
PH	Phase(s)	V	Volts
PSI	Pounds Per Square Inch	VAV	Variable Air Volume
P.T.	Pitot Traverse	VD	Volume Damper
		VFD	Variable Frequency Drive
RA	Return Air	VP	Velocity Pressure
RF	Return Air Fan		
R.G.	Return Grille	W	Watts
RHC	Reheat Coil	WB	Wet Bulb
RPM	Revolutions per Minute	W.D.	Water Density
		W.G.	Water Guage
SA	Supply Air		
SAT	Supply Air Temperature	F	Degrees Fahrenheit
S.D.	Supply Diffuser		
SEF	Smoke Exhaust Fan	ΔP	Differential (Delta) Pressure or Pressure Drop
SF (AIR)	Supply Fan		
S.F.(Elect)	Service Factors		
SHC	Steam Heating Coil	ΔT	Differential (Delta) Temperature, Net Temperature Decrease or Increase
S.P. "W.C."	Static Pressure Measured in Inches of Water Column	#	PSI or Pounds Per Square Inch Decrease or Increase

Project:	Brighton Division, Boston Municipal Court PH 4		
Address:	Boston, MA		
Date:	1/19/2022	**Project No.**	21-537

REPORT SUMMARY

The following is the report for the Wrentham District Court with the following comments:

1. AHU-1 is presently running at 72% of design airflow an will require a sheave change to increase airflow to design.

2. AHU-2 is presently running at 82% of design airflow an will require a sheave change to increase airflow to design.

3. AHU-3 is presently running at 77% of design airflow an will require a sheave change to increase airflow to design.

Project:	Brighton Division, Boston Municipal Court PH 4		
Address:	Boston, MA		
Date:	1/19/2022	**Project No.**	21-537

REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
AHU-1	2,333 CFM	1,242 CFM	1,091 CFM
AHU-2	2,128CFM	NA	2,128 CFM
AHU-3	962 CFM	NA	962 CFM
RTU-1	3,721 CFM	2,591 CFM	1,130 CFM
RTU-2	4,090 CFM	2,255 CFM	1,835 CFM

UNIT	EXHAUST
EF-1	704 CFM
EF-2	245 CFM
EF-3	336 CFM
EF-4	682 CFM
EF-5	1,271 CFM
EF-6	535 CFM

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

FAN DATA SHEET

	FAN NO. AHU-1		FAN NO. AHU-2	
Serves / Location:	FCU's	Basement Mech	FCU's	Basement Mech
Manufacturer:	McQuay		McQuay	
Model Number:	LSL108CH		LSL1D3CH	
Size:	NL		NL	
Serial Number:	35B00388-06		3580C381-06	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	DAYTON	NL	MAGNETEK
Frame Number:	NL	143-5T	NL	L143T
Horsepower:	NL	2	NL	1
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.25
Volts/Phase:	230/460/3	210/3	200-230/460/3	210/3
Motor Amperage:	5.6/2.8	5.6	3.5-3.8/1.9	4
Motor RPM:	1745	1750	1745	1750
Speeds:	NL	BELT DRIVEN	NL	BELT DRIVEN
Heater Size:	NL	NA	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3255	2333	2600	2128 *2
Return Air CFM:	2135	1242		
Exhaust Air CFM:				
Outside Air CFM:	1120	1091	2600	2128
Suction Pressure:	NL	-0.74	NL	-0.81
Discharge Pressure:	NL	0.58	NL	0.11
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	1.32	NL	0.92
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	1075	NA	945	NA
Motor Drive:	NL	NA	NL	NA
Motor Size/Bore:	NL	NA	NL	NA
Fan Drive:	NL	NA	NL	NA
Fan Size/Bore:	NL	NA	NL	NA
Belt Size / Number:	NL	NA	NL	NA
Shafts C-C:	NL	NA	NL	NA
Turns Open:	NL	NA	NL	NA

Comments:

***2 100% outside air unit.**

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : T1
OUTSIDE AIR TRAVERSE LOCATION: Basement Mech. Rm.

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	24	" WIDTH x	10	" DEPTH	Sq Ft =	1.67

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.74	InWg.	DESIGN CFM =	1120
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1091
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1090**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	719	609	608	705			
B	806	512	600	703			
C	733	523	611	700			
D	721	599	602	701			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 653

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Phil Chiaraluce / Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : T1
RETURN TRAVERSE LOCATION: Basement Mech. Rm.

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	12 " DEPTH	Sq Ft =	2.50

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.01	InWg.	DESIGN CFM =	2135
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	450
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**450**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	144	173	201	166	162		
B	165	203	194	189	174		
C	168	200	195	187	190		
D	177	191	179	195	151		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 180

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Phil Chiaraluce / Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: AHU-2 TRAVERSE NUMBER : T1
OUTSIDE AIR TRAVERSE LOCATION: Basement Mech. Rm.

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	14 " DEPTH	Sq Ft =	2.92

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.5	InWg.	DESIGN CFM =	2600
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2128
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2127**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	262	350	617	862	1172		
B	303	362	593	874	1176		
C	396	552	657	935	1031		
D	689	825	815	1054	1069		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 730

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Phil Chiaraluce / Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

FAN DATA SHEET

	FAN NO. AHU-3		FAN NO.	
Serves / Location:	FCU's	Basement Mech		
Manufacturer:	McQuay			
Model Number:	LSL103CH			
Size:	NL			
Serial Number:	35B00390-06			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	MAGNETEK		
Frame Number:	NL	L143T		
Horsepower:	NL	1		
Brake Horsepower:	NL	NA		
Safety Factor:	NL	1.25		
Volts/Phase:	200-230/460	210/3		
Motor Amperage:	3.5-3.8-1.9	3.2		
Motor RPM:	1745	1750		
Speeds:	NL	BELT DRIVEN		
Heater Size:	NL	NA		
Heater Amps.:	NL	NA		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1255	962 *1		
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	1255	962		
Suction Pressure:	NL	-0.98		
Discharge Pressure:	NL	0.23		
Fan Static Pressure:	NL	NA		
External Pressure:	NL	1.21		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	1170	NA		
Motor Drive:	NL	NA		
Motor Size/Bore:	NL	NA		
Fan Drive:	NL	NA		
Fan Size/Bore:	NL	NA		
Belt Size / Number:	NL	NA		
Shafts C-C:	NL	NA		
Turns Open:	NL	NA		

Comments: ***1 100% Outside air unit.**

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : T1
OUTSIDE AIR TRAVERSE LOCATION: Basement Mech. Rm.

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	22	" WIDTH x	10	" DEPTH	Sq Ft =	1.53

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.67	InWg.	DESIGN CFM =	1255
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	962
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**961**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	586	667	532	436			
B	791	761	587	449			
C	922	728	419	633			
D	773	684	556	547			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 629

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Phil Chiaraluce / Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

FAN DATA SHEET

	FAN NO. RTU-1		FAN NO. RTU-2	
Serves / Location:	Courtroom 2	ROOF	Courtroom 1	ROOF
Manufacturer:	YORK		YORK	
Model Number:	J12ZJN24R2A2BCD5A1		J12ZJN24R2A2BCD5A1	
Size:	NL		NL	
Serial Number:	N1F9060180		N1F9060179	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	BALDOR	NL	BALDOR
Frame Number:	NL	184T	NL	184T
Horsepower:	NL	5	NL	5
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	208-230/460/3	152/3	208-230/460/3	173/3
Motor Amperage:	13.5-13/6.5	10.1	13.5-13/6.5	11.4
Motor RPM:	1750	1221	1750	1316
Speeds:	VFD	41.87 Hz	VFD	45.11 Hz
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	4000	3721	4000	4090
Return Air CFM:	2800	2591	2800	2255
Exhaust Air CFM:				
Outside Air CFM:	1200	1130 *1	1200	1835 *2
Suction Pressure:	NL	NA	NL	NA
Discharge Pressure:	NL	NA	NL	NA
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	1740	NA	1740	NA
Motor Drive:	NL	NA	NL	NA
Motor Size/Bore:	NL	NA	NL	NA
Fan Drive:	NL	NA	NL	NA
Fan Size/Bore:	NL	NA	NL	NA
Belt Size / Number:	NL	NA	NL	NA
Shafts C-C:	NL	NA	NL	NA
Turns Open:	NL	NA	NL	NA

Comments: ***1 OA damper at 20%.**

***2 OA damper at 18%.**

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: RTU-1 TRAVERSE NUMBER : T1
SUPPLY TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	14	" DEPTH	Sq Ft =	2.92

AIR DENSITY DATA

STATIC PRESS @ CL:	0.19	InWg.	DESIGN CFM =	NA
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2225
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2227**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	383	635	513	231	574	721	
B	1000	782	850	723	799	909	
C	971	1066	1034	677	990	872	
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 18 AVERAGE FPM = 763

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Sean Hayward

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: RTU-1 TRAVERSE NUMBER : T2
SUPPLY TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	28	" WIDTH x	10	" DEPTH	Sq Ft =	1.94

AIR DENSITY DATA

STATIC PRESS @ CL:	0.07	InWg.	DESIGN CFM =	NA
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1496
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1498**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	776	827	851	796	810		
B	680	693	749	811	874		
C	593	715	727	825	817		
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 15 AVERAGE FPM = 770

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Sean Hayward

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: RTU-1 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	28 1/2	" WIDTH x	20 1/2 " DEPTH	Sq Ft =	4.06

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	1200
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1130
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1130**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	288		271				
B		308					
C	252		273				
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 5 AVERAGE FPM = 278

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: RTU-2 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	28	" WIDTH x	12	" DEPTH	Sq Ft =	2.33

AIR DENSITY DATA

STATIC PRESS @ CL:	0.19	InWg.	DESIGN CFM =	NA
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2099
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2101**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	921	931	949	923	930	939	
B	945	897	970	820	956	710	
C	781	946	917	937	926	792	
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 18 AVERAGE FPM = 899

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: RTU-2 TRAVERSE NUMBER : T2
Supply TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	12 " DEPTH	Sq Ft =	2.50

AIR DENSITY DATA

STATIC PRESS @ CL:	0.1	InWg.	DESIGN CFM =	NA
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1991
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1993**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	861	808	888	891	884		
B	600	743	791	855	908		
C	565	663	753	848	888		
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 15 AVERAGE FPM = 796

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Sean Hayward / Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: RTU-2 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	28 1/2	" WIDTH x	20 1/2 " DEPTH	Sq Ft =	4.06

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	1200
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1833
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1834**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	455		463				
B		486					
C	420		435				
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 5 AVERAGE FPM = 452

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

FAN DATA SHEET

	FAN NO. EF-1		FAN NO. EF-2	
Serves / Location:		ROOF		ROOF
Manufacturer:	GREENHECK		GREENHECK	
Model Number:	G-103-VG-4		G-095-VG-6	
Size:	NL		NL	
Serial Number:	1601669		1601677	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	VARI GREEN	NL	VARI GREEN
Frame Number:	NL	NL	NL	NL
Horsepower:	NL	1/4	NL	1/6
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.25	NL	NL
Volts/Phase:	115/1	115/1	115/1	115/1
Motor Amperage:	2.85	2.9	2.3	2.3
Motor RPM:	1750	DIRECT DRIVE	1750	DIRECT DRIVE
Speeds:	VARIABLE	10 (HIGH SPEED)	VARIABLE	10 (HIGH SPEED)
Heater Size:	NL	NA	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	820	704	200	245
Outside Air CFM:				
Suction Pressure:	NL	NA	NL	NA
Discharge Pressure:	NL	NA	NL	NA
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Belt Size / Number:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open:	NL	DIRECT DRIVE	NL	DIRECT DRIVE

Comments:

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

AIR DISTRIBUTION

SYSTEM: EF-1 & EF-2
SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-1						
C103	1	12X9	FH	NA	NA	150	93 *1
104	2	6X6	FH	NA	NA	100	114
105	3	6X6	FH	NA	NA	100	143
107	4	6X6	FH	NA	NA	70	88
G-7	5	6X6	RV	NA	NA	100	106
G-6	6	6X6	FH	NA	NA	100	55
G-5	7	6X6	FH	NA	NA	100	61
G-3	8	6X6	FH	NA	NA	100	44
					TOTAL:	820	704
	EF-2						
C133	1	6X6	FH	NA	NA	100	128
C132	2	6X6	FH	NA	NA	100	117
					TOTAL:	200	245

Comments: *1 No access to dampers, above cell ceiling.

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

FAN DATA SHEET

	FAN NO. EF-3		FAN NO. EF-4	
Serves / Location:		ROOF		ROOF
Manufacturer:	GREENHECK		GREENHECK	
Model Number:	G-095-VG-6		G-099-VG-4	
Size:	NL		NL	
Serial Number:	16010679		16010681	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	VARI GREEN	NL	VARI GREEN
Frame Number:	NL	NL	NL	NL
Horsepower:	NL	1/6	NL	1/4
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	115/1	115/1	115/1	115/1
Motor Amperage:	2.3	2.4	2.85	2.8
Motor RPM:	1750	DIRECT DRIVE	1750	DIRECT DRIVE
Speeds:	VARIABLE	10 (HIGH SPEED)	VARIABLE	10 (HIGH SPEED)
Heater Size:	NL	NA	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	300	336	1000	682
Outside Air CFM:				
Suction Pressure:	NL	NA	NL	NA
Discharge Pressure:	NL	NA	NL	NA
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	1149	DIRECT DRIVE	1049	DIRECT DRIVE
Motor Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Belt Size / Number:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open:	NL	DIRECT DRIVE	NL	DIRECT DRIVE

Comments:

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

AIR DISTRIBUTION

SYSTEM: EF-3 & EF-4

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-3						
C127	1	6X6	FH	NA	NA	150	187
C127	2	6X6	FH	NA	NA	150	149
					TOTAL:	300	336
	EF-4						
C123	1	8X6	FH	NA	NA	150	117
C123	2	8X6	FH	NA	NA	150	106
C18	3	6X6	RV	NA	NA	100	56
G23	4	8X6	FH	NA	NA	150	93
G23	5	8X6	FH	NA	NA	150	103
G22	6	8X6	FH	NA	NA	150	110
G22	7	8X6	FH	NA	NA	150	97
					TOTAL:	1000	682

Comments:

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

FAN DATA SHEET

	FAN NO. EF-5		FAN NO. EF-6	
Serves / Location:		ROOF		ROOF
Manufacturer:	GREENHECK		GREENHECK	
Model Number:	G-123-VG-5		G-095-VG-6	
Size:	NL		NL	
Serial Number:	16010682		16010683	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	VARI GREEN	NL	VARI GREEN
Frame Number:	NL	NL	NL	NL
Horsepower:	NL	1/2	NL	1/6
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	115/1	115/1	115/1	115/1
Motor Amperage:	6.4	6.4	2.3	2.3
Motor RPM:	1750	DIRECT DRIVE	1750	DIRECT DRIVE
Speeds:	VARIABLE	10 (HIGH SPEED)	VARIABLE	10 (HIGH SPEED)
Heater Size:	NL	NA	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	1340	1271	470	535
Outside Air CFM:				
Suction Pressure:	NL	NA	NL	NA
Discharge Pressure:	NL	NA	NL	NA
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	1353	DIRECT DRIVE	1423	DIRECT DRIVE
Motor Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Belt Size / Number:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open:	NL	DIRECT DRIVE	NL	DIRECT DRIVE

Comments:

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

AIR DISTRIBUTION

SYSTEM: EF-5 & EF-6

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-5						
G11	1	12X9	FH	NA	NA	130	97
G12	2	12X9	FH	NA	NA	130	129
GC9	3	15X12	FH	NA	NA	230	*1
GC10	4	12X9	FH	NA	NA	130	*1
GC11	5	12X9	FH	NA	NA	130	*1
GC12	6	12X9	FH	NA	NA	130	*1
GC13	7	12X9	FH	NA	NA	130	*1
GC14	8	12X9	FH	NA	NA	130	*1
G20	9	6X6	FH	NA	NA	100	*1
C109	10	6X6	FH	NA	NA	100	156
					TOTAL:	1340	1271
	EF-6						
C110	1	6X6	FH	NA	NA	70	110
C112	2	12X9	FH	NA	NA	100	157 *2
C114	3	12X9	FH	NA	NA	150	140 *2
C115	4	12X9	FH	NA	NA	150	128 *2
					TOTAL:	470	535

Comments: *1 Measured by duct traverse, 889 cfm.
*2 No access to dampers, above cell ceiling.

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** 21-537

TRAVERSE DATA

SYSTEM: EF-5 TRAVERSE NUMBER : T1
TRAVERSE LOCATION: Basement

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	18	" WIDTH x	10	" DEPTH	Sq Ft =	1.25

AIR DENSITY DATA

STATIC PRESS @ CL:	0.21	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	889
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**890**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	606	589	661				
B	650	610	811				
C	665	639	1020				
D	631	627	1023				
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 711

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Brighton Division, Boston Municipal Court PH 4
Address: Boston, MA
Date: 1/19/2022 **Project No.** **21-537**

FLOW METERING DATA

SYSTEM: Hot Water

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	GAUGE Pd	SET Pd	DESIGN GPM	SET GPM	BALANCING VLV SET @
	AHU-1	1	NA	Ultrasonic	5.8	6.2	NA
	AHU-2	1 1/2	NA	Ultrasonic	14.2	15	NA
	AHU-3	1 1/4	NA	Ultrasonic	7.5	8.2	NA

Comments: